“CONCEPT DESIGN OF SPACE-SAVING CHILDREN BIKE FRAME AND HANDLE”

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ABSTRACT

Innovation of folding bikes have been in the market ranging from children's bikes to adults, the shape and concept is still the same can be folded into two parts, namely the front folded and the neck handlebar bicycle that can be folded so that the size becomes small compared with the original size, to be able to taken everywhere. There is no bike in the market that can minimize its size smaller when stored and easier when taken, come on bikes children are not long-term use, when the children were grown children's bicycles can not go back and will be stored. Taken from the above questions it will merancanga a child-friendly bike products when stored. Designing a product has several steps and begins with developing a concept, the method used in this research is Product Design and Development by Ulrich and Eppinger.

The first step is the concept of concept in the manufacture of products begins with the manufacture of concepts, concepts that exist in this study using examples of heuristic design in the conception of engineering. Bicycles are designed components of the bike, only the frame and handlebar only, because this component has a size large enough. The process of data processing by means of conceptual drafting and composed of 6 advanced concepts with concept selection result 1 concept developed. After processing can be drawn conclusions to make a bike that is stiff and has a smaller size when stored in the back of the frame using the concept of making attachable components or removed, the front frame using the concept of folding and handlebar using the concept of fold.

Keywords: Ulrich, Designing, Product, Bicycle

1 INTRODUCTION

Children's bicycles for ages 4 to 6 are many on the market there that have a folded concept, but just like adult folding bikes, with the folded front frame folding concept and handlebar neck folded down. Although the children's bikes have a small size but still require a large storage size. There are no bikes in the market that can further minimize the size to be smaller when stored, especially the children's bikes are not long-term use, meaning that when the children were growing up the children's bikes are not reused and will be stored.

Therefore, the idea to design a child bike product that has smaller size when stored, only requires a small space when stored. The bike that is designed is a bike for children aged 4 to 6 years. Designing a product has several steps and begins with designing a concept, the method used in this research is Product Design and Development by Ulrich and Eppinger. The first step is the preparation of the concept because in the manufacture of products begins with the creation of concepts, concepts that exist in this study using external search

that is the method taken from the journal Design Heuristic in Engineering Concept Generation. The bike that is designed is not all components of the bike, just the frame and handlebar only.

2 LITERATURE REVIEW

Products are everything that a manufacturer can offer to be noticed, requested, searched, bought, used or consumed by the market as the fulfillment or desire of the relevant market [1]. According to Ulrich and Eppinger the company that deals in manufacturing especially in producing highly bergatung products on the ability to analyze, identify consumer needs [2]. According to the journal Design and product development is divided into six phases [3].

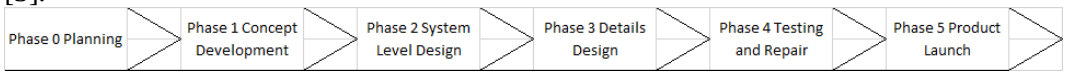


Figure 2.1. Product Design and Development Phase

The phase composition of product development is the 1st phase of 6 phases of product design and development. Beginning with a mission statement ending with a development plan. Each phase has its own steps. According to Rosnani Ginting This phase (product development) has the goal of selecting one of the best single alternatives of some of the alternatives available and the best alternative is the output of the analytical phase (the previous phase) [4].

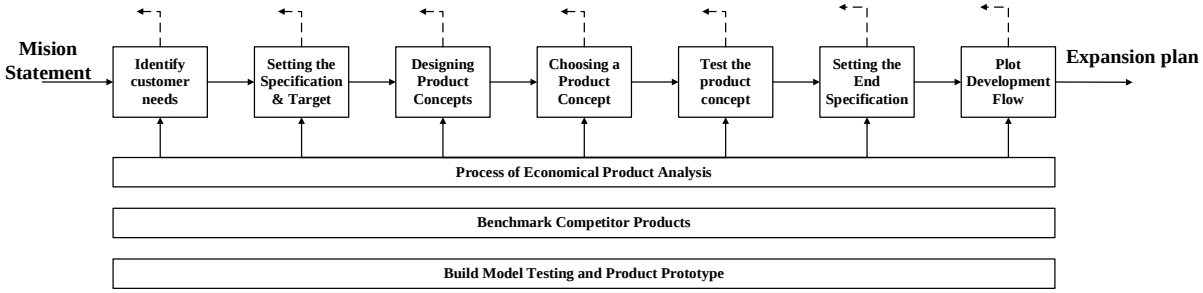


Figure 2.2. Product Development Phase

3 RESULTS AND DISCUSSION

Beginning with the mission statement is to make the concept of a bike frame and handlebar that is not rigid, has a smaller frame and bike frame size when stored. The next stage is the preparation of the concept using a combination table. In the combination table there are three subproblems: handlebar, rear frame and front frame having solutions such as fold and rotate for sub-handlebar problems, for backstage frame issues have solutions as standard component and make components attachable or detachable and last subproblems of the front frame with solutions as follows; fold, slide component and make components attachable or detachable.

Table 3.1. combination table concept frame and handlebar

handlebar	back frame	front frame
Fold	*Standard Components*	*Fold*
Rotate	*Make components attachable or detachable*	*Slide Components*
		Make components attachable or detachable

Stage compilation concept is composed of 6 concepts, then 6 concepts are arranged will be continued on concept selection to selected one concept to be developed. Phase selection concept has 2 tools namely; concept filtering and concept evaluation, each tool has a reference concept that will be the concept of comparison, the concept of reference in this study using the concept of commercial bike on the market now or can be called the concept of a standard bike and here is the data processing:

Table 3.2. Filtering Concept Connection

Selection criteria	Concept					
	Concept **1**	Concept **2**	Concept **3**	Concept **4**	Concept **5**	Concept **6**
Ease of Bicycle Assembly	-	-	-	-	-	-
Ease of Care	-	0	0	-	0	-
Process Work	-	0	0	-	0	0
Dimension Storage Space	+	+	+	+	+	+
Dimension Frame at Saved	+	0	+	+	0	+
Dimension Handlebar at Saved	+	+	+	+	+	+
Quantity +	3	2	3	3	2	3
Quantity 0	0	3	2	0	3	1
Quantity -	3	1	1	3	1	2
Final Score	0	1	2	0	1	1
Ranking	3	2	1	3	2	2
Continue ?	No	Yes	Yes	No	Yes	Yes

The concept screening tool produces four concepts that will proceed on the assessment of concepts, the concept consists of; concept 2, concept 3, concept 5 and concept 6.
To process the concept scoring tool using the following formula:

$$S_j = \sum_{i=1}^{n} r_{ij}\, w_i$$

information:
rj = Value of concept j for criterion i
wi = Weight for criterion i
n = Number of criteria
Sj = Total value for concept j

Table 3.5. Assessment Concepts Frame and Handlebar

Selection criteria	Bobot	Concept							
		Concept 2		Concept 3		Concept 5		Concept 6	
		Rating	Weight Value	Rating	Weight Value	Rating	Weight Value	Rating	Weight Value
Ease of Bicycle Assembly	15%	2	0,30	2	0,30	2	0,30	2	0,30
Ease of Care	5%	3	0,15	3	0,15	3	0,15	2	0,10
Process Work	5%	3	0,15	3	0,15	3	0,15	3	0,15
Dimension Storage Space	35%	4	1,40	4	1,40	4	1,40	4	1,40
Dimension Frame at Saved	20%	3	0,60	4	0,80	3	0,60	4	0,80
Dimension Handlebar at Saved	20%	5	1,00	5	1,00	5	1,00	5	1,00
Final Score		3,6		3,8		3,6		3,75	
Ranking		3		1		3		2	
Continue ?		No		Yes		No		No	

Table 3.3. is a concept appraisal table, not much different from the concept screening, but on the assessment of the concept of each criterion has a percentage weight. The concept of concept tool produces 1 selected concept to be developed. The selected kosep is concept 3 with a total value of 3.8

After the chosen concept 3 will be developed, then the following is a description of the concept 3.

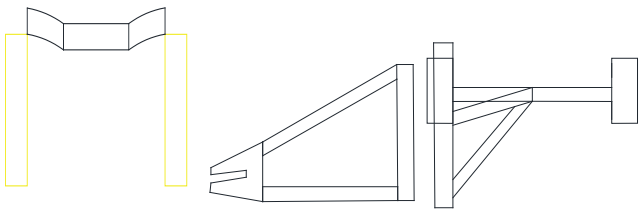


Figure 3.1. Selected Frame and Selected Stang Concept

Concept 3 has a solution on the handlebar that is fold, has a solution to the back of the frame make components attachable or detachable and solution for the framework of the front of the fold. After the manufacture of prototypes, it can be measured dimensions of the frame and handlebar with a new concept with the following sizes; the size of the initial handlebar 47.5 cm long after having a new concept that is fold to 10 cm, the initial front frame size has a length of 34.5 cm after having a new concept of 24.5 cm, while for the rear frame has the same size as the initial size ie 24 cm. Bicycle frames and handlebars with the new concept can minimize storage size as it has smaller dimensions and can be incorporated into boxes with box dimensions as follows; length of box 53.5 cm, width 35 cm and height 32 cm. The following storage dimensions are smaller than the bike sizes that have the existing framework and handlebar concept in the market with the following initial storage dimensions; length 84 cm, width 49 cm and height 62 cm. Below is the bike design of 3 concepts plus size.

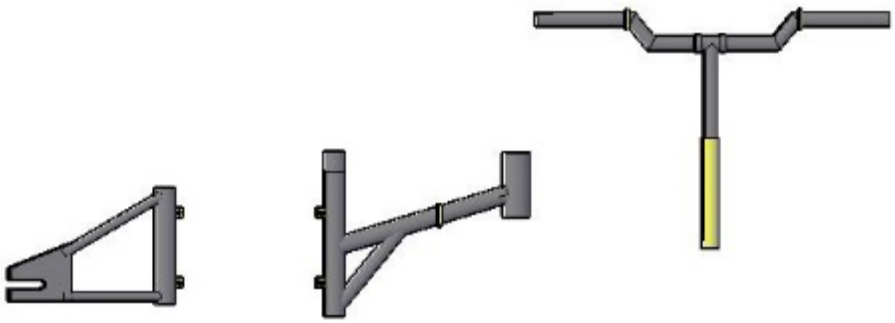


Figure 3.2. Design Frame and Handlebar



Figure 3.3. Photos Kids Bicycle Product Latest Concept

4. Conclusion

After the above explanation, it can be concluded that to make the children's bikes are not rigid and have smaller size when stored in the back frame using the concept make components attachable or detachable, the front frame using the concept of fold and handlebar using the concept of fold.

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